# **EAST Search History**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	15627	HARRISON.in. GIERASCH.in. VERDINE.in. "SHI.in. "	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 15:55
L2	34	l1 and opioid	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:07
L3	1114	564/123 564/161 564/170 564/171 564/174	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:08
L4	0	l3 and l1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:08
L5	0	I3 and I2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:08
L6	18	I3 and opioid	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:08
L7	18	l6 not l2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:12
L8	80	endomorphin-2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:12
L9	1	l8 and l1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:13

# **EAST Search History**

			•			
L10	0	l8 and l3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:13
L11	77	l8 and derivat\$	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:13
L12	40	l8 and opioid	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:13
L13	37	l11 and opioid	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:14
L14	36	l13 not l2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:14
L15	36	l14 not l6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2006/11/10 16:14

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        AUG 30
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                 CA/CAplus enhanced with more pre-1907 records
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         SEP 21
NEWS 7
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                 truncation
         SEP 25
NEWS
      8
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         SEP 25
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                 CAS REGISTRY(SM) no longer includes Concord 3D coordinates
         SEP 25
NEWS 10
                 CAS REGISTRY(SM) updated with amino acid codes for pyrrolysine
NEWS 11
         SEP 28
                 CEABA-VTB classification code fields reloaded with new
                 classification scheme
                 LOGOFF HOLD duration extended to 120 minutes
NEWS 12
         OCT 19
NEWS 13
         OCT 19
                 E-mail format enhanced
                 Option to turn off MARPAT highlighting enhancements available
NEWS 14
         OCT 23
NEWS 15
         OCT 23
                 CAS Registry Number crossover limit increased to 300,000 in
                 multiple databases
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         OCT 23
                 The Derwent World Patents Index suite of databases on STN
                 has been enhanced and reloaded
         OCT 30
NEWS 17
                 CHEMLIST enhanced with new search and display field
NEWS 18
        NOV 03
                 JAPIO enhanced with IPC 8 features and functionality
NEWS EXPRESS NOVEMBER 10 CURRENT WINDOWS VERSION IS V8.01c, CURRENT
              MACINTOSH VERSION IS V6.0c(ENG) AND V6.0Jc(JP),
              AND CURRENT DISCOVER FILE IS DATED 25 SEPTEMBER 2006.
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#### L1 STRUCTURE UPLOADED

=> d 11

L1 HAS NO ANSWERS

L1

STR

Structure attributes must be viewed using STN Express query preparation.

=> s 11 SAMPLE SEARCH INITIATED 14:55:33 FILE 'REGISTRY' SAMPLE SCREEN SEARCH COMPLETED - 6820 TO ITERATE

29.3% PROCESSED 2000 ITERATIONS INCOMPLETE SEARCH (SYSTEM LIMIT EXCEEDED) SEARCH TIME: 00.00.01

0 ANSWERS

FULL FILE PROJECTIONS: ONLINE \*\*COMPLETE\*\*

> BATCH \*\*COMPLETE\*\*

PROJECTED ITERATIONS:

131449 TO 141351

PROJECTED ANSWERS:

0 TO

L2

0 SEA SSS SAM L1

=> s 11 full

FULL SEARCH INITIATED 14:55:40 FILE 'REGISTRY' FULL SCREEN SEARCH COMPLETED -135643 TO ITERATE

100.0% PROCESSED 135643 ITERATIONS 48 ANSWERS

SEARCH TIME: 00.00.08

48 SEA SSS FUL L1 L3

=> d 13 scan

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Carbamic acid, [(1S, 2S, 4E, 6R, 7R) - 8 - [[(1S) - 2 - amino - 2 - oxo - 1 - amino -(phenylmethyl) ethyl] amino] -1-[[4-(1,1-dimethylethoxy) phenyl] methyl] -2,6dihydroxy-8-oxo-7-(phenylmethyl)-4-octenyl]-, 1,1-dimethylethyl ester (9CI)

MF C40 H53 N3 O7

Absolute stereochemistry. Double bond geometry as shown.

\*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):20

REGISTRY COPYRIGHT 2006 ACS on STN L348 ANSWERS

IN Benzenepropanamide,  $\alpha = (1R, 2E, 5S, 6S) - 6$ -amino-1,5-dihydroxy-7-(4-. hydroxy-2,  $6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, (<math>\alpha R$ )-(9CI)

MF C32 H40 N2 O4

## \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, <math>(\alpha R)$ - (9CI)

MF C33 H41 N3 O5

Absolute stereochemistry.
Double bond geometry as shown.

#### \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, (<math>\alpha$ R)- (9CI)

MF C33 H40 N2 O5

Absolute stereochemistry. Double bond geometry as shown.

# \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha = [(1R, 2E, 5S, 6S) - 6 - amino - 1, 5 - dihydroxy - 7 - (4 - hydroxyphenyl) - 2 - heptenyl] - N - (2 - phenylethyl) - , (<math>\alpha R$ ) - (9CI)

Absolute stereochemistry.

Double bond geometry as shown.

# \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha$ -[(1S,2Z,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI)

MF C31 H37 N3 O5

Absolute stereochemistry.

Double bond geometry as shown.

## \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI)

MF C31 H37 N3 O5

# \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha$ -[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI)

MF C31 H37 N3 O5

Absolute stereochemistry.

Double bond geometry as shown.

#### \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI)

MF C31 H37 N3 O5

Absolute stereochemistry. Double bond geometry as shown.

# \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha$ -[(1R,2E,5R,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI)

MF C31 H37 N3 O5

## \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, <math>(\alpha R)$ - (9CI)

MF C33 H42 N2 O5

Absolute stereochemistry.
Double bond geometry as shown.

# \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)-(9CI)

MF C32 H40 N2 O4

Absolute stereochemistry.
Double bond geometry as shown.

# \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha = [(1S, 2E, 5S, 6S) - 6 - amino - 1, 5 - dihydroxy - 7 - (4 - hydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyll - N - [(1S) - 2 - amino - 2 - oxo - 1 - dihydroxy - 2, 6 - dimethylphenyll - 2 - heptenyll - 2 - heptenyll$ 

(phenylmethyl)ethyl]-,  $(\alpha R)$ - (9CI) MF C33 H41 N3 O5

Absolute stereochemistry. Double bond geometry as shown.

## \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-,  $(\alpha R)$ - (9CI)

MF C31 H38 N2 O5

Absolute stereochemistry.

Double bond geometry as shown.

## \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1S,2Z,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI)

MF C31 H37 N3 O5

#### \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ , $\zeta$ ,4-trihydroxy- $\alpha$ -(phenylmethyl)-,( $\alpha$ R, $\beta$ R, $\zeta$ R, $\eta$ S)- (9CI)

MF C31 H39 N3 O5

Absolute stereochemistry.

$$\begin{array}{c|c} & \text{OH} & \text{OH} & \text{O} \\ & \text{SR} & \text{(CH2)} \\ & \text{NH2} & \\ & \text{Ph} & \text{O} \\ & \text{Ph} & \text{O} \\ & \text{Ph} & \text{O} \\ \end{array}$$

#### \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

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IN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI)

MF C31 H37 N3 O5

Absolute stereochemistry.

Double bond geometry as shown.

#### \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

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MF C31 H37 N3 O5

#### \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI)

MF C31 H37 N3 O5

Absolute stereochemistry.

Double bond geometry as shown.

## \*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

MF C40 H53 N3 O7

Absolute stereochemistry.
Double bond geometry as shown.

\*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

L3 48 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha = [(1R, 2E, 5R, 6S) - 6 - amino - 1, 5 - dihydroxy - 7 - (4 - hydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - (2 - phenylethyl) - , (<math>\alpha R$ ) - (9CI)

MF C32 H40 N2 O4

Absolute stereochemistry. Double bond geometry as shown.

\*\*PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT\*\*

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):0'O' IS NOT VALID HERE

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=> s 13 .

3 L3

=> d 14 ibib abs hitstr 1-YOU HAVE REQUESTED DATA FROM 3 ANSWERS - CONTINUE? Y/(N):y

ANSWER 1 OF 3 CAPLUS COPYRIGHT 2006 ACS on STN ACCESSION NUMBER: 2004:333687 CAPLUS DOCUMENT NUMBER: 140:339637 TITLE: Preparation of peptidomimetic µ-opioid receptor ligands INVENTOR(S): Harrison, Bryce; Gierasch, Tiffany Malinky; Verdine, Gregory L.; Shi, Zhangjie PATENT ASSIGNEE(S): President and Fellows of Harvard College, USA SOURCE: PCT Int. Appl., 128 pp. CODEN: PIXXD2 DOCUMENT TYPE: Patent LANGUAGE: English FAMILY ACC. NUM. COUNT: PATENT INFORMATION: DATE PATENT NO. KIND APPLICATION NO. \_\_\_\_\_ \_\_\_\_\_ 20040422 WO 2003-US32280 20031010 WO 2004033414 **A**1 W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG AU 2003279953 A1 20040504 AU 2003-279953 US 2004254225 Α1 20041216 US 2003-683756 20031010 PRIORITY APPLN. INFO.: US 2002-417925P P 20021011 US 2003-443428P Ρ 20030129 WO 2003-US32280 . W 20031010 MARPAT 140:339637 OTHER SOURCE(S): The invention relates to peptidomimetic compds. derived from aralkyl-substituted aminodihydroxyalk(en)oic acids which are modulators of the  $\mu$ -opioid receptor (MOR) and thus have therapeutic applications. The claims include compds. of general formula R52NCHR1CH(OH)CH2CHRCHRCH(OH)CHR2CO-X-CHR3R4 [R2 is H2 or a bond; X is N, O or S; R1-R3 are (un)substituted (hetero)arylalkyl; R4 is H, CONR72 (R7 is H, alkyl, acyl or a protecting group), CONHR7, CH2OH, CH(OH)CH:CH2 or CONHCHR10CO2H (R10 is an amino acid side chain); R5 is H, alk(en)yl, (hetero)aryl, acyl, a protecting group or COCHR10CO2H] or their pharmaceutically-acceptable salts. Thus, stereoisomeric H2NCH(CH2C6H4OH-p)CH(OH)CH2CH:CHCH(OH)CH(CH2Ph)CONHCH(CH2Ph)CONH2 (2) were prepared and assayed for binding affinity for MOR [8.8  $\pm$  0.7 nM for (S,S,S,R)-2, vs. 1.2 ± 0.1 nM for endomorphin 2]. 479495-67-5P 479495-68-6P 479495-69-7P ΙT 479495-70-0P 479495-71-1P 479495-72-2P 479495-73-3P 479495-74-4P 479495-75-5P 479495-76-6P 479495-77-7P 479495-78-8P 479495-79-9P 479495-80-2P 479495-81-3P 479495-83-5P 479495-84-6P 479495-85-7P 479495-86-8P 479496-03-2P 479496-04-3P

479496-05-4P 479496-06-5P 479496-11-2P 479496-12-3P 479496-13-4P 479496-14-5P 479496-15-6P 479496-16-7P 479496-17-8P 479496-18-9P 479496-19-0P 503186-38-7P 503186-39-8P 503186-40-1P 503186-41-2P

503186-42-3P 503186-43-4P 503186-44-5P 503186-45-6P 503186-46-7P 503186-47-8P

503186-48-9P

RL: PAC (Pharmacological activity); SPN (Synthetic preparation); THU (Therapeutic use); BIOL (Biological study); PREP (Preparation); USES (Uses)

(preparation of peptidomimetic  $\mu$ -opioid receptor ligands)

RN 479495-67-5 CAPLUS

CN Benzenepropanamide, α-[(1R, 2E, 5R, 6R)-6-amino-1, 5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αS)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-68-6 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-69-7 CAPLUS

CN Benzenepropanamide, α-[(1R, 2E, 5R, 6S)-6-amino-1, 5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αS)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479495-70-0 CAPLUS

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-71-1 CAPLUS

CN Benzenepropanamide, α-[(1S,2E,5R,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.
Double bond geometry as shown.

RN 479495-72-2 CAPLUS

CN Benzenepropanamide, α-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.
Double bond geometry as shown.

RN 479495-73-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479495-74-4 CAPLUS

CN Benzenepropanamide, α-[(1S,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479495-75-5 CAPLUS

CN Benzenepropanamide, α-[(1R,2E,5R,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-76-6 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479495-77-7 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R, 2E, 5R, 6S)-6-amino-1, 5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-78-8 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-79-9 CAPLUS

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-80-2 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI) (CA INDEX NAME)

RN 479495-81-3 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479495-83-5 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ , $\zeta$ ,4-trihydroxy- $\alpha$ -(phenylmethyl)-,( $\alpha$ R, $\beta$ S, $\zeta$ S, $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479495-84-6 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ ,  $\zeta$ , 4-trihydroxy- $\alpha$ -(phenylmethyl)-, ( $\alpha$ R,  $\beta$ R,  $\zeta$ S,  $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479495-85-7 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ , $\zeta$ ,4-trihydroxy- $\alpha$ -(phenylmethyl)-, ( $\alpha$ R, $\beta$ R, $\zeta$ R, $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479495-86-8 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ , $\zeta$ ,4-trihydroxy- $\alpha$ -(phenylmethyl)-,( $\alpha$ R, $\beta$ S, $\zeta$ R, $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479496-03-2 CAPLUS

CN. Benzenepropanamide, α-[(1S,2Z,5S,6S).-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl].-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-04-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2Z,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479496-05-4 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2Z,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-06-5 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2Z,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-11-2 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479496-12-3 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-13-4 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-14-5 CAPLUS

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-15-6 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479496-16-7 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.
Double bond geometry as shown.

RN 479496-17-8 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-18-9 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479496-19-0 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 503186-38-7 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 503186-39-8 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-40-1 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 503186-41-2 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, <math>(\alpha R)$ - (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-42-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 503186-43-4 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)-(9CI) (CA INDEX NAME)

RN 503186-44-5 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)-(9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-45-6 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)-(9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-46-7 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)-(9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-47-8 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R, 2E, 5S, 6S)-6-amino-1, 5-dihydroxy-7-(4-hydroxy-2, 6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ S)-(9CI) (CA INDEX NAME)

RN 503186-48-9 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

CN Carbamic acid, [(1S,2S,4E,6S,7R)-8-[[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]amino]-1-[[4-(1,1-dimethylethoxy)phenyl]methyl]-2,6-dihydroxy-8-oxo-7-(phenylmethyl)-4-octenyl]-, 1,1-dimethylethyl ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 680187-49-9 CAPLUS

CN Carbamic acid, [(1S,2S,4E,6R,7R)-8-[[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]amino]-1-[[4-(1,1-dimethylethoxy)phenyl]methyl]-2,6-dihydroxy-8-oxo-7-(phenylmethyl)-4-octenyl]-, 1,1-dimethylethyl ester (9CI) (CA INDEX NAME)

RN 680187-50-2 CAPLUS

CN Carbamic acid, [(1S,2R,4E,6R,7R)-8-[[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]amino]-1-[[4-(1,1-dimethylethoxy)phenyl]methyl]-2,6-dihydroxy-8-oxo-7-(phenylmethyl)-4-octenyl]-, 1,1-dimethylethyl ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 680187-51-3 CAPLUS

CN Carbamic acid, [(1S,2R,4E,6S,7R)-8-[[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]amino]-1-[[4-(1,1-dimethylethoxy)phenyl]methyl]-2,6-dihydroxy-8-oxo-7-(phenylmethyl)-4-octenyl]-, 1,1-dimethylethyl ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

REFERENCE COUNT:

4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 2 OF 3 CAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER:

2003:72698 CAPLUS

DOCUMENT NUMBER:

138:271935

TITLE:

2,6-Dimethyltyrosine Analogues of a Stereodiversified Ligand Library: Highly Potent, Selective, Non-Peptidic

μ Opioid Receptor Agonists

AUTHOR(S): Harrison, Bryce A.; Pasternak, Gavril W.; Verdine,

Gregory L.

CORPORATE SOURCE: Department of Chemistry and Chemical Biology, Harvard

University, Cambridge, MA, 02138, USA

SOURCE: Journal of Medicinal Chemistry (2003), 46(5), 677-680

CODEN: JMCMAR; ISSN: 0022-2623

PUBLISHER: American Chemical Society

DOCUMENT TYPE: Journal LANGUAGE: English

OTHER SOURCE(S): CASREACT 138:271935

GΙ

Me 
$$CH_2Ph$$
 $H_2N$ 

OH OH O  $CH_2Ph$  I

The authors report the synthesis and bioactivity of enediol-based 2,6-dimethyltyrosine analogs I (X = NH, R = CONH2; X = NH, R = H; X = NH, R = CH2OH; X = O, R = CONH2; X = O, R = H; X = O, R = CH2OH) towards  $\mu$ -opioid receptor. For I (X = NH, R = CONH2; X = NH, R = H), five stereoisomers of each compound were synthesized and their bioactivity evaluated, discovering certain stereoisomers with unexpected potency, selectivity, and efficacy.

TT 503186-38-7P 503186-39-8P 503186-40-1P 503186-41-2P 503186-42-3P 503186-43-4P 503186-44-5P 503186-45-6P 503186-46-7P 503186-47-8P 503186-48-9P

RL: BSU (Biological study, unclassified); SPN (Synthetic preparation); BIOL (Biological study); PREP (Preparation)

(asym. preparation of enediol-based nonpeptidic analogs of dimethyltyrosine and their evaluation as  $\mu$ -opioid receptor agonists)

RN 503186-38-7 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, <math>(\alpha R)$ - (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 503186-39-8 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, <math>(\alpha R)$ - (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-40-1 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-41-2 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, <math>(\alpha R)$ - (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-42-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, <math>(\alpha S)-(9CI)$  (CA INDEX NAME)

RN 503186-43-4 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, (<math>\alpha$ R)-(9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 503186-44-5 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)-(9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-45-6 CAPLUS

CN Benzenepropanamide,  $\alpha = [(1R, 2E, 5S, 6S) - 6 - amino - 1, 5 - dihydroxy - 7 - (4 - hydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - (2 - phenylethyl) - , (<math>\alpha R$ ) - (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-46-7 CAPLUS

CN Benzenepropanamide,  $\alpha = [(1R, 2E, 5R, 6S) - 6 - amino - 1, 5 - dihydroxy - 7 - (4 - hydroxy - 2, 6 - dimethylphenyl) - 2 - heptenyl] - N - (2 - phenylethyl) - , (<math>\alpha R$ ) - (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 503186-47-8 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-(2-phenylethyl)-, (<math>\alpha S$ )-(9CI) (CA INDEX NAME)

Absolute stereochemistry.

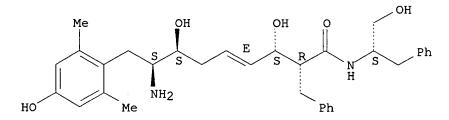
Double bond geometry as shown.

RN 503186-48-9 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxy-2,6-dimethylphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.



REFERENCE COUNT:

24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 3 OF 3 CAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER:

2002:808520 CAPLUS

DOCUMENT NUMBER:

138:55660

TITLE:

High-Affinity Mu Opioid Receptor Ligands Discovered by the Screening of an Exhaustively Stereodiversified

Library of 1,5-Enediols

AUTHOR(S):

Harrison, Bryce A.; Gierasch, Tiffany Malinky; Neilan,

Claire; Pasternak, Gavril W.; Verdine, Gregory L.

CORPORATE SOURCE:

Department of Chemistry and Chemical Biology, Harvard

University, Cambridge, MA, 02138, USA

SOURCE:

Journal of the American Chemical Society (2002),

124(45), 13352-13353

CODEN: JACSAT; ISSN: 0002-7863

PUBLISHER: DOCUMENT TYPE: American Chemical Society Journal

LANGUAGE:

English

OTHER SOURCE(S):

CASREACT 138:55660

GΙ

AΒ A stereodiversified library of all 16 stereoisomers of 1,5-enediol I was synthesized, and these compds. were screened for mu opioid receptor (MOR) binding. The stereochem. configuration of I strongly impacted the binding affinity, and (S,S,S,R)-I exhibited a Ki of 8.8 nM for MOR, comparable to that of endomorphin-2 (Ki = 1.2 nM). Moreover, compds. I exhibited 5-86-fold selectivity for MOR over delta opioid receptor (DOR) and 16-150-fold selectivity for MOR over kappa opioid receptor (KOR). Addnl., analogs of I were synthesized which showed that the trans configuration of the olefin was important for receptor binding but modifications of the C-terminal amino acid were well tolerated. Of these analogs, tetraols II are noteworthy because they retain only one of the amide bonds present in endomorphin-2, but bind MOR with an affinity of 10 nM and 110- and 600-fold selectivity for MOR over DOR and KOR. These results demonstrate the utility of stereochem. diversity in the discovery of bioactive small mols.

479495-67-5P 479495-68-6P 479495-69-7P IT 479495-70-0P 479495-71-1P 479495-72-2P 479495-73-3P 479495-74-4P 479495-75-5P 479495-76-6P 479495-77-7P 479495-78-8P 479495-79-9P 479495-80-2P 479495-81-3P 479495-82-4P 479495-83-5P 479495-84-6P 479495-85-7P 479495-86-8P 479496-03-2P 479496-04-3P 479496-05-4P 479496-06-5P 479496-11-2P 479496-12-3P 479496-13-4P 479496-14-5P 479496-15-6P 479496-16-7P 479496-17-8P 479496-18-9P 479496-19-0P

RL: PAC (Pharmacological activity); SPN (Synthetic preparation); BIOL (Biological study); PREP (Preparation)

(preparation of amino(dihydroxy)nonenamides and derivs. as nonpeptidic high-affinity  $\mu$ -opioid receptor ligands)

RN 479495-67-5 CAPLUS

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-68-6 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-69-7 CAPLUS

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-70-0 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-71-1 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5R,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-72-2 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479495-73-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479495-74-4 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.
Double bond geometry as shown.

RN 479495-75-5 CAPLUS

Absolute stereochemistry. Double bond geometry as shown.

RN 479495-76-6 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479495-77-7 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-78-8 CAPLUS

CN Benzenepropanamide, α-[(1R,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-79-9 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5R,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.
Double bond geometry as shown.

RN 479495-80-2 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI) (CA INDEX NAME)

RN 479495-81-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479495-82-4 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6R)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479495-83-5 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ , $\zeta$ ,4-trihydroxy- $\alpha$ -(phenylmethyl)-, ( $\alpha$ R, $\beta$ S, $\zeta$ S, $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479495-84-6 CAPLUS
CN Benzenenonanamide, 
$$\eta$$
-amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ ,  $\zeta$ , 4-trihydroxy- $\alpha$ -(phenylmethyl)-, ( $\alpha$ R,  $\beta$ R,  $\zeta$ S,  $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479495-85-7 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ ,  $\zeta$ , 4-trihydroxy- $\alpha$ -(phenylmethyl)-, ( $\alpha$ R,  $\beta$ R,  $\zeta$ R,  $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

RN 479495-86-8 CAPLUS

CN Benzenenonanamide,  $\eta$ -amino-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]- $\beta$ , $\zeta$ ,4-trihydroxy- $\alpha$ -(phenylmethyl)-, ( $\alpha$ R, $\beta$ S, $\zeta$ R, $\eta$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

OH OH OH OH NH2

$$S R (CH_2) 3 S R H$$
 $NH_2 Ph$ 

RN 479496-03-2 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2Z,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN. 479496-04-3 CAPLUS

Absolute stereochemistry.
Double bond geometry as shown.

RN 479496-05-4 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2Z,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-06-5 CAPLUS

CN Benzenepropanamide, α-[(1S,2Z,5R,6S)-6-amino-1,5-dihydroxy-7-(4hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

RN 479496-11-2 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-12-3 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-13-4 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R, 2E, 5R, 6S)-6-amino-1, 5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-(2-phenylethyl)-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-14-5 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479496-15-6 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-16-7 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-1-(hydroxymethyl)-2-phenylethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 479496-17-8 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 479496-18-9 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,5S,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 479496-19-0 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,5R,6S)-6-amino-1,5-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S,2R)-2-hydroxy-1-(phenylmethyl)-3-butenyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

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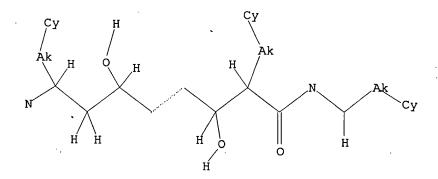
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100.0% PROCESSED 147523 ITERATIONS

SEARCH TIME: 00.00.09

16 ANSWERS

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L6 16 ANSWERS REGISTRY COPYRIGHT 2006 ACS on STN

IN Benzenepropanamide,  $\alpha-[(1S,2E,4R,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha R$ )- (9CI)

MF C31 H37 N3 O5

Absolute stereochemistry.
Double bond geometry as shown.

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L7 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2006 ACS on STN GI

AB Using olefin cross-metathesis, the authors synthesized a novel stereodiversified library of I containing a trans-1,4-enediol. Screening this library for mu opioid receptor (MOR) affinity identified multiple high-affinity ligands and revealed that the stereochem. configuration varied widely among those ligands having the highest affinity. It was not possible to predict the configurations of the most active I stereoisomers on the basis of the configuration of endomorphin-2, a known MOR peptide ligand, validating the diversity-based approach to ligand discovery.

ACCESSION NUMBER:

2003:110339 CAPLUS

DOCUMENT NUMBER:

138:297095

TITLE:

Unpredictable Stereochemical Preferences for Mu Opioid Receptor Activity in an Exhaustively Stereodiversified

Library of 1,4-Enediols

AUTHOR(S):

SOURCE:

CORPORATE SOURCE:

Shi, Zhangjie; Harrison, Bryce A.; Verdine, Gregory L. Department of Chemistry and Chemical Biology, Harvard

University, Cambridge, MA, 02138, USA Organic Letters (2003), 5(5), 633-636

CODEN: ORLEF7; ISSN: 1523-7060

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Journal English

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OTHER SOURCE(S):

CASREACT 138:297095

T 507276-41-7P 507276-43-9P 507276-45-1P 507276-47-3P 507276-49-5P 507276-51-9P

507276-53-1P 507276-55-3P 507276-57-5P

507276-59-7P 507276-61-1P 507276-63-3P 507276-65-5P 507276-67-7P 507276-69-9P

507276-71-3P

RL: PAC (Pharmacological activity); PRP (Properties); SPN (Synthetic preparation); BIOL (Biological study); PREP (Preparation)

(unpredictable stereochem. preferences for mu opioid receptor activity in an exhaustively stereodiversified library of enediols in relation to partial agonist activity)

RN 507276-41-7 CAPLUS

Absolute stereochemistry. Double bond geometry as shown.

RN 507276-43-9 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1R,2E,4R,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 507276-45-1 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,4R,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 507276-47-3 CAPLUS

CN Benzenepropanamide,  $\alpha$ -[(1S,2E,4R,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, ( $\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.
Double bond geometry as shown.

RN 507276-49-5 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,4S,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 507276-51-9 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,4S,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 507276-53-1 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,4S,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

RN 507276-55-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,4S,6R)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 507276-57-5 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,4R,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

RN 507276-59-7 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,4R,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

RN 507276-61-1 CAPLUS

CN Benzenepropanamide, α-[(1S,2E,4R,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (αR)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

S R E S R NH2

$$NH_2$$
 OH Ph

 $Ph$ 
 $NH_2$  OH Ph

RN 507276-63-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,4R,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 507276-65-5 CAPLUS

Absolute stereochemistry.
Double bond geometry as shown.

RN 507276-67-7 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1R,2E,4S,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

RN 507276-69-9 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,4S,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ R)- (9CI) (CA INDEX NAME)

Absolute stereochemistry.

Double bond geometry as shown.

RN 507276-71-3 CAPLUS

CN Benzenepropanamide,  $\alpha-[(1S,2E,4S,6S)-6-amino-1,4-dihydroxy-7-(4-hydroxyphenyl)-2-heptenyl]-N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-, (<math>\alpha$ S)- (9CI) (CA INDEX NAME)

Absolute stereochemistry. Double bond geometry as shown.

22

REFERENCE COUNT:

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